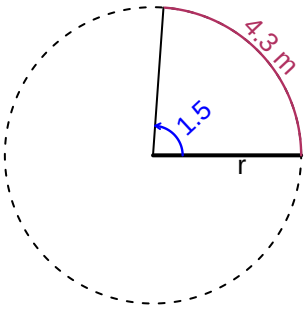
Name: Date:

Trig Final (SLTN v645)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 4.3 meters. The angle measure is 1.5 radians. How long is the radius in meters?

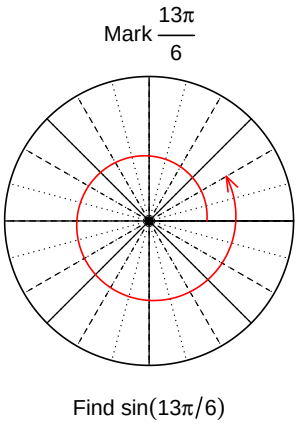


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

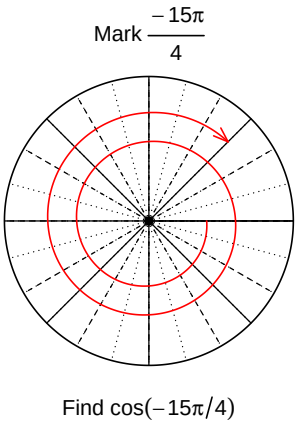
$r = 2.867$ meters.

Question 2

Consider angles $\frac{13\pi}{6}$ and $\frac{-15\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{13\pi}{6}\right)$ and $\cos\left(\frac{-15\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\sin(13\pi/6)$



Find $\cos(-15\pi/4)$

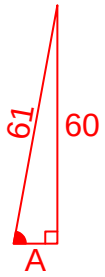
$\sin(13\pi/6) = \frac{1}{2}$

$\cos(-15\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\sin(\theta) = \frac{60}{61}$, and θ is in quadrant II, determine an exact value for $\cos(\theta)$.

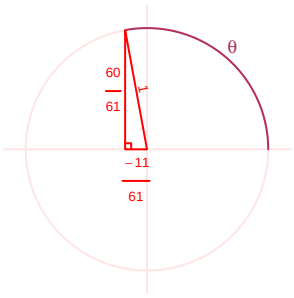
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 60^2 = 61^2$$
$$A = \sqrt{61^2 - 60^2}$$
$$A = 11$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\cos(\theta) = \frac{-11}{61}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 4.04 Hz, a midline at $y = -7.64$ meters, and an amplitude of 5.96 meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 5.96\sin(2\pi 4.04t) - 7.64$$

or

$$y = 5.96\sin(8.08\pi t) - 7.64$$

or

$$y = 5.96\sin(25.38t) - 7.64$$